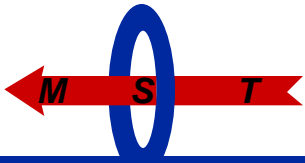


Optical Probe for Local Measurements of Plasma Velocity

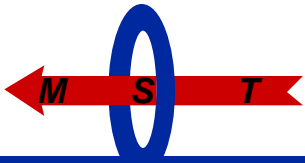
G. Fiksel, D. J. Den Hartog, P. Fontana
University of Wisconsin - Madison
Department of Physics

A device for local sampling of plasma radiation is described. The radiation is observed with two fused silica bundles with the lines of views crossing at 90° . Each line of view is terminated by a view dump, thus achieving the locality. The spatial resolution is about 5cm. The device is arranged in the form of an insertable probe protected from the plasma by a Boron Nitride enclosure, therefore the radial profiles can be measured. The plasma velocity is deduced by the red and blue Doppler shifts of the corresponding radiation spectra. All three components of the velocity - radial, poloidal, and toroidal can be measured. The range of the probe applications includes the studies of fluctuation driven transport, the RFP dynamo, and ion viscosity. Initial velocity measurements in MST using the He II 468.6 nm line are presented.

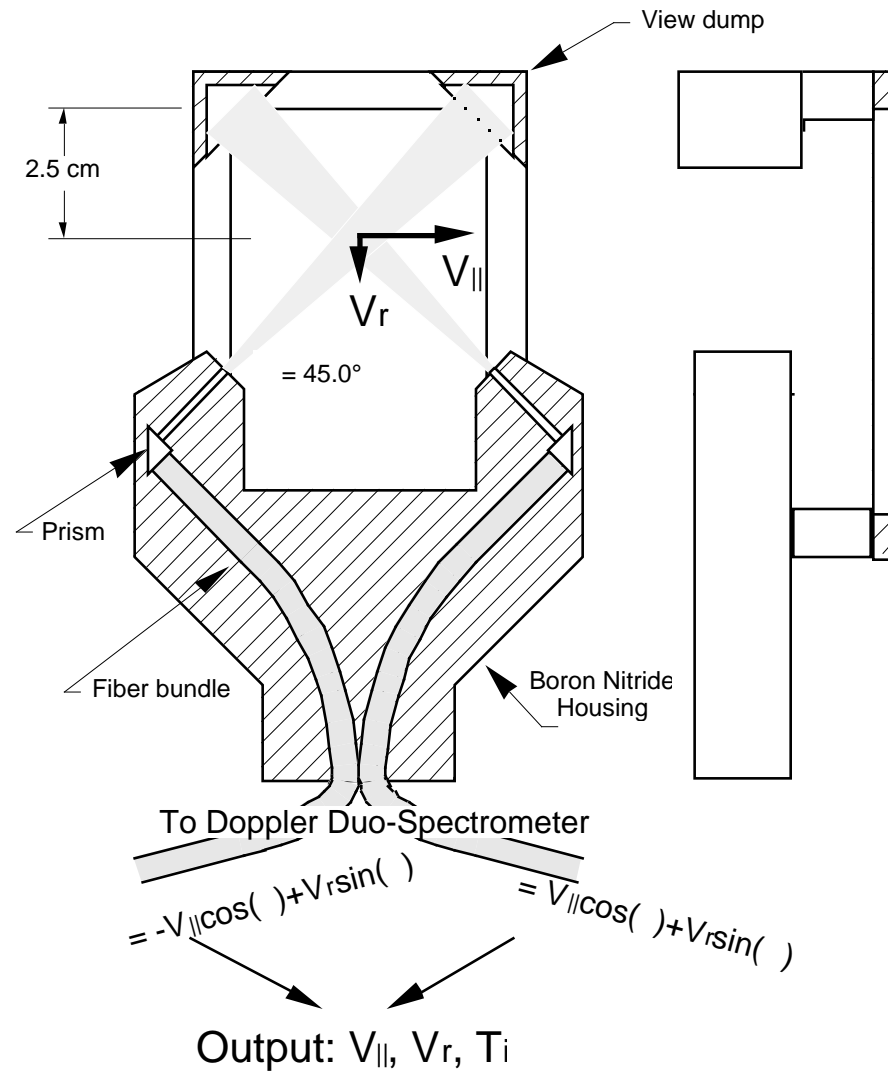


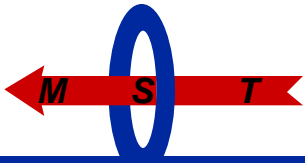
Motivation

- Radial profile of ion velocity and temperature
- Velocity shear and confinement improvement
- Anomalous ion heating
- Particle transport
- MHD Dynamo

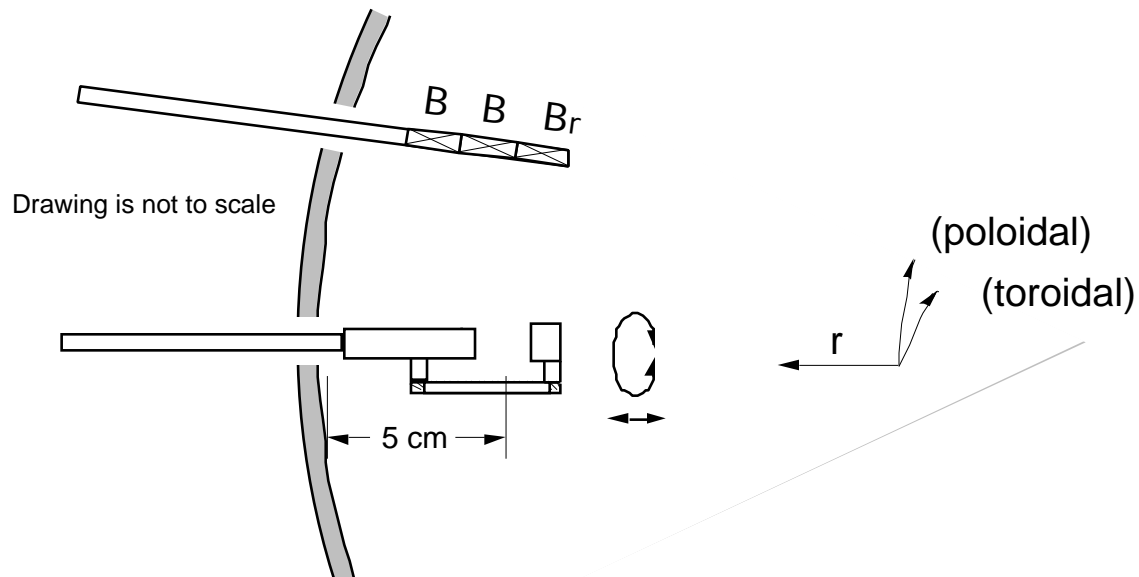


Optical Probe





Experimental Setup

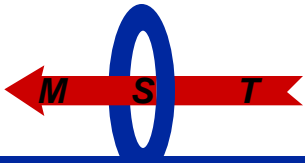


Optical probe was inserted at 5 cm

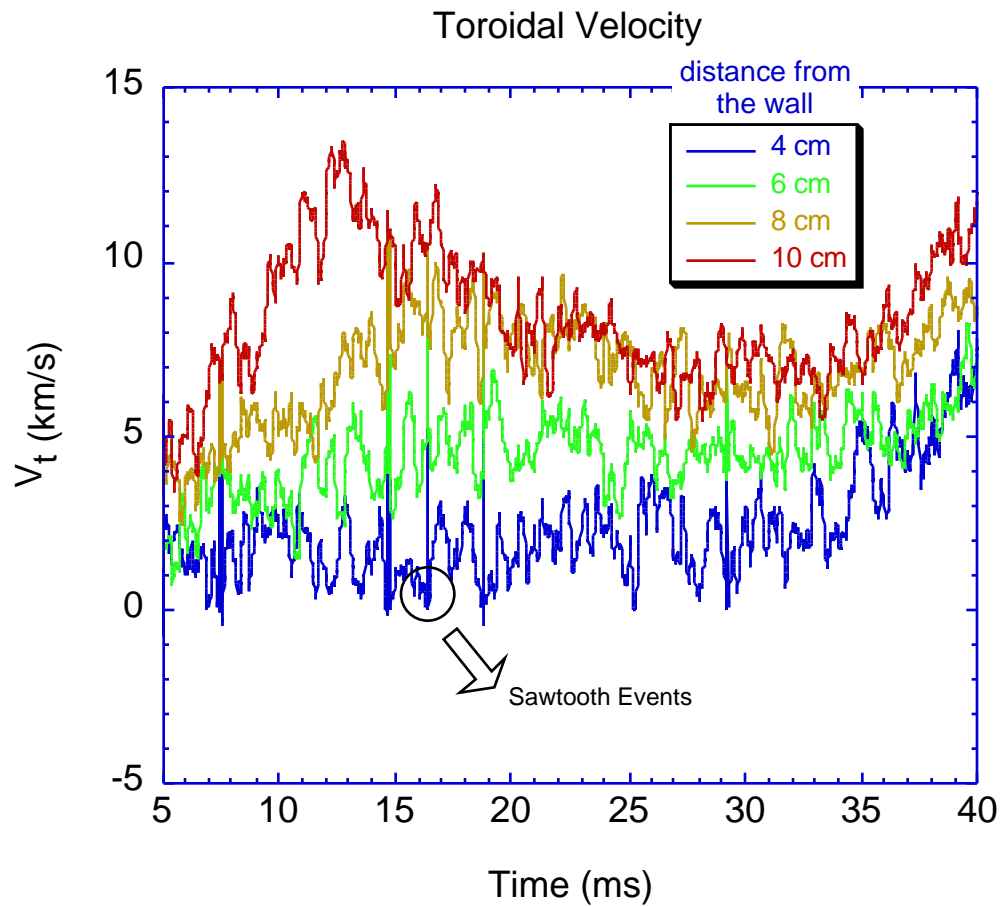
Small amount of He was puffed and He II 468.6 nm line was used

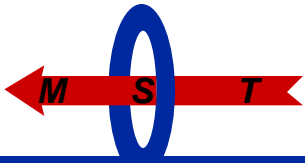
Measured: V , V_r

Magnetic fluctuations were measured with a separate probe

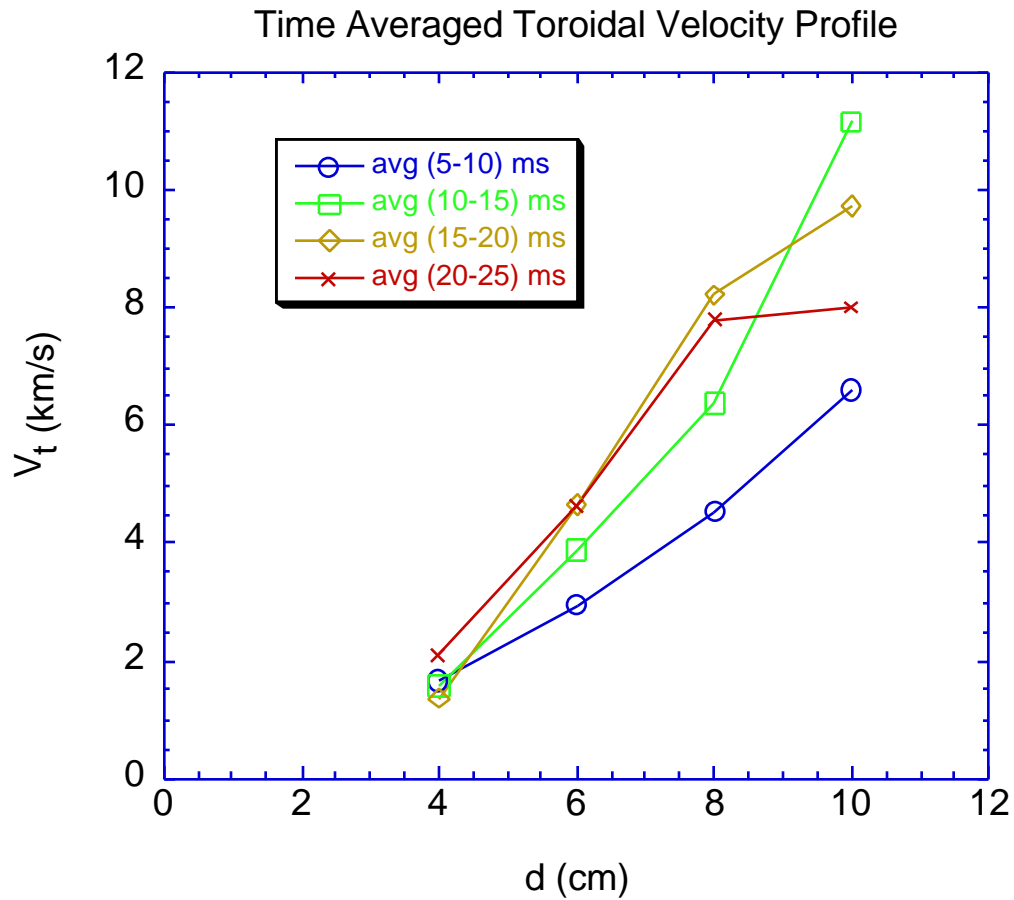


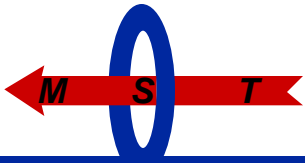
Toroidal Velocity



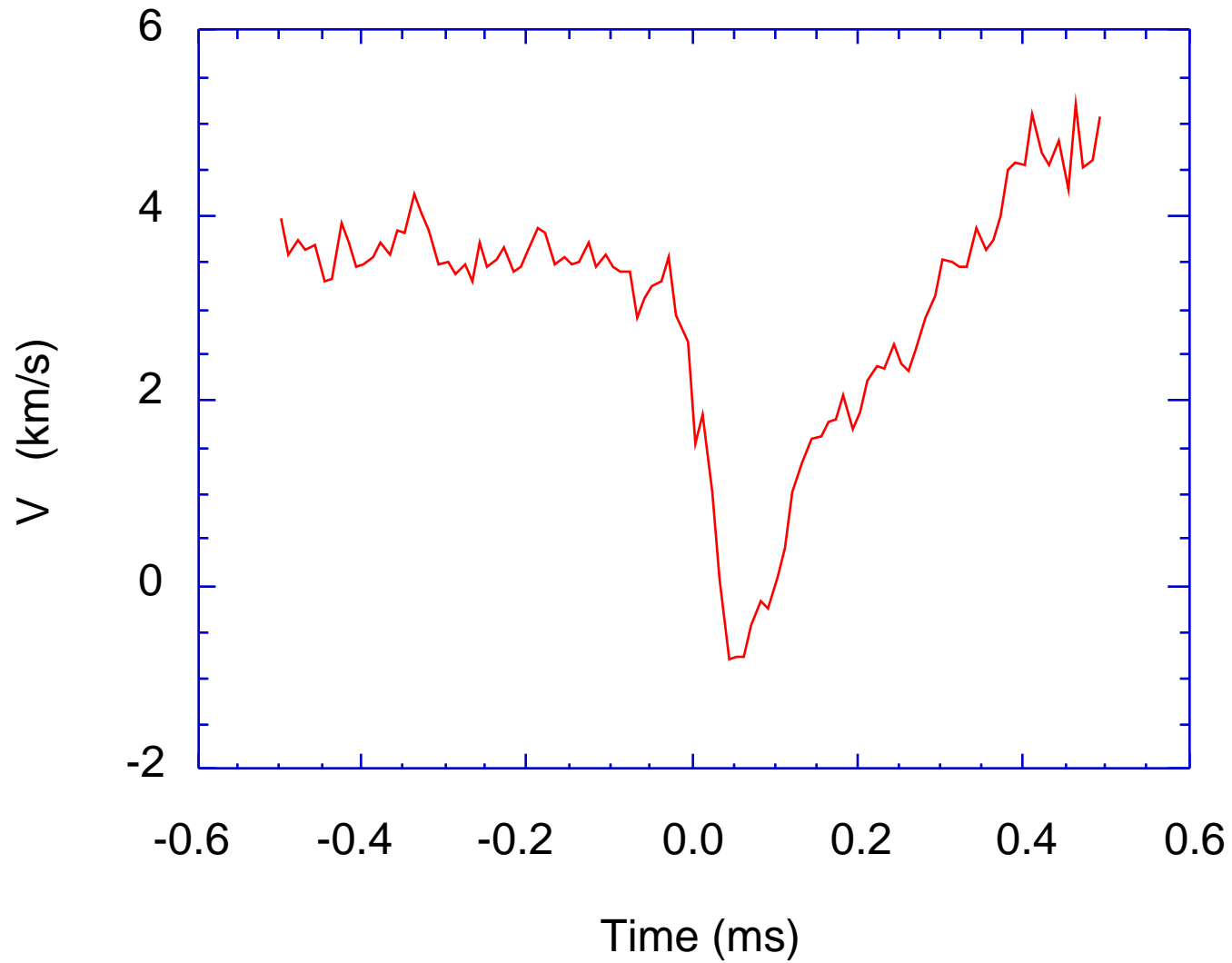


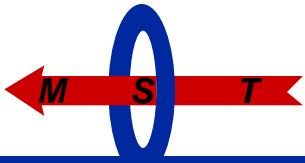
Toroidal Velocity Profile





Toroidal Velocity Sawtooth Ensemble Average





MHD Dynamo

Dynamo Electric Field $E = \langle \tilde{v}_r \tilde{B} \rangle$ (V/m)

Sawtooth Ensemble Average

